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ABSTRACT

This paper reports on some early findings from an assessment of the impact of mathematics and science reforms in Chicago, Illinois, Memphis, Tennessee, Miami, Florida, and El Paso, Texas. These reforms have been part of the National Science Foundation's Urban Systemic Reform program. Standards-based curriculum and instructional approaches with a constructivist orientation to teaching and learning have been adopted in the four sites. In early 1999, baseline data were examined for each of the four cities at the school level. This report focuses on some initial observations from El Paso, where it is apparent that standards-based instruction is often interpreted through the lens of the high stakes test used. One unintended outcome is the practice of teaching to the test, and in El Paso, this reality is being used to provide a vehicle for teachers and students to grapple with how to respond to students' low scoring items on the Texas Assessment of Academic Skills. Some of the themes that are emerging from teachers' comments about standards-based reforms are: (1) teachers value hands-on problem-solving approaches to teaching mathematics and science; (2) teachers learn instructional strategies from engaging in hands-on staff development work; and (3) teachers can learn effective student problem-solving strategies from the students themselves. Concerns that remain in this study and the overall project are identifying the context of policies involved in the reform and discussing policy alignment as it relates to reform strategies. (SLD)

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How Do Standards Matter? Linking Policy to Practice in Four Cities Implementing Systemic Reform

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Objectives. Our assessment of the impact of math and science reforms in Chicago, Memphis, Miami and El Paso examines outcomes of the National Science Foundation's Urban Systemic Reform (USI) program, a multi-year effort in 20 cities designed to increase student achievement in math and science and to reduce the achievement gap. Standards-based curriculum and instructional approaches alongside a constructivist orientation to teaching and learning have been adopted in the four sites selected for inclusion in our research. An important objective of our work is to determine the extent to which national, state, and local standards for instruction in math and science have been adopted and put into practice at the classroom level. A further objective is to determine if standards-based instruction and constructivist approaches have an important effect on student outcomes.

One important measure of student outcomes is student performance on mandated achievement tests. These state-level tests are designed to be in line with standards, but may or may not be in line with constructivist, problem-solving approaches to teaching and learning approaches. During our 30-month study (now in its second year) we are attempting to unravel the constraints, dilemmas and contradictions that are apparent in any systemic reform initiative to better understand how schools and school districts can improve student outcomes and reduce achievement gaps overall. In this paper we will present background information and use the El Paso Collaborative for Academic Excellence, one of our USI sites to discuss one approach to grapple with issues in teaching, learning and assessment related to high stakes tests.

USI sites. In 1993 and again in 1994 the National Science Foundation actively solicited applications from cities with large percentages of residents classified as living in poverty. Not surprisingly these cities also had unenviable records of low student achievement. A few, however, were undertaking reforms aimed at increasing the achievement of all students and decreasing the student achievement gap. In large part patterned after the College-Board Equity 2000 project, the NSF's Urban Systemic Initiative aimed at creating a system-wide reform based on the implementation of standards-based curriculum and assessments in math and science, the elimination of low level course-work and social promotion, and the requirement of Algebra 1 in 8th grade with algebraic concepts woven into the curriculum very early on..

The four sites working with us in undertaking this study had all achieved a measure of success in enhancing student achievement over the course of the implementation of USI reforms. However, each site also faced its share of challenges. The four sites selected for the study have operated relatively successful USI programs for at least three years. They reflect regional variation and systematic differences in size. Two, **Chicago** and **Miami**, are very large districts (ranking 3rd and 4th nationally); the other two, **Memphis** and **El Paso**, are comparably smaller. The two size categories co-vary in student ethnic characteristics. Students in Memphis and Chicago are predominantly African American (70% and 55% respectively). El Paso and Miami students are predominantly Hispanic (85% and 52%), although of different national origins (Mexican American and Cuban American, respectively). Chicago has a substantial Hispanic student population (31%), whereas Memphis has very few (1%). Miami has a substantial number of African American students (36%), whereas El Paso has only 3% African American students. In various combinations, therefore, all four districts have overwhelming numbers of traditionally underserved students. They also reflect high levels of child poverty and chronically

low levels of student achievement. All four cities currently face state imposed mandates to improve school performance and raise test scores of students. In all four, there have been wide gaps in educational attainment between minority and non-minority students.

Chicago: The Chicago School District has 424,000 students in 557 schools. The USI (CSI) began in 1994. Reforms in Chicago have been carried out under conditions of intense pressure to show improvement in student performance. For example, in 1995 the state of Illinois took control of the Chicago School District and turned authority over to the Mayor for a period of 4 years. Against these challenges and problems, however, Chicago has access to a rich array of external resources from business and university partners and calls on a long tradition of political activism at all levels. Chicago reflects a high degree of autonomy and site-based management at the school level. Individual schools have flexibility to design and organize curriculum as long as they meet academic standards and prepare students for assessment. An elaborate feedback structure characterizes the CSI. Design teams in each school include participation by Local School Council (LSC) comprised of a majority of parents and community leaders. Subdistricts have their own advisory boards who work with USI design teams. Each of the 6 regions has a Local School Facilitator to coordinate reforms, and there is an overall CSI advisory board representing all stakeholders. University partners provided staff development and research support. CSI has commissioned a variety of research efforts to facilitate self-assessment.

Miami: The Miami-Dade School District has 346,000 students and 302 schools. The city of Miami is one of the most diverse and arguably most volatile cities in the United States. Well over 80% of students are ethnic minorities, most from homes where languages other than English are spoken. Recent years have seen major upheavals in city and county politics, school district

reorganization, and leadership changes in the district. Like many other districts in the state, Miami has been plagued with growth not matched by allocations for school construction and operations. Mobility of students poses problems for continuity of reform. In 1995-96, 42,000 students moved into the district, 34,000 moved out, and 39,000 moved within the city; more than a third of the total enrollment. Since the Miami-Dade USI began in 1994, there have been four different superintendents. The district is divided into 6 regions, each with its own elected school board member. There are 56 "feeder patterns" or geographic clusters of elementary schools linked to particular secondary schools. The USI plan emphasizes facilitating transitions between grades in these feeders.

Memphis: The Memphis City School District has 110,000 students and 160 schools. The largest city in a predominantly rural state, Memphis has struggled with high levels of poverty and, traditionally, the worst performing schools in the state. More than one third of students drop out before completing high school. However, the District has a strong advocate in the city's mayor, a former superintendent, and in its current superintendent who has actively pursued improvement through reform. As one of Tennessee's "break the mold" districts, Memphis has flexibility in addressing problems, although no exemption from stringent state mandated tests that some critics view as a serious obstacle to curricular reform. There have been site-based management councils since 1992. Memphis is one of the sites where the New American Schools reform initiative is well established. Memphis was one of 6 cities to win commendation from NEA for productive collaboration between the administration and the teachers' union. The Memphis USI was granted funding in 1995. Professional development for teachers and support for both parents and students have been major emphases.

El Paso: Three school districts in El Paso have 125,000 students and 137 schools. Located directly across the border from Juarez, Mexico, El Paso is the 5th poorest city in the United States; more than 25% of residents are below the poverty line, 25% are foreign born, 30% of adults are illiterate, and in more than half the homes Spanish is the preferred language. El Paso confronts unique barriers to increased student achievement. In response to strong pressures from the state of Texas, community leaders formed the El Paso Collaborative for Academic Excellence. This broad-based group made improvement in math and science as its leading priority in advance of the USI initiative. El Paso is divided among three separate districts (El Paso, Ysleta, and Socorro), all of whom have pledged to work together on reforms. The principal goal is to provide all students with the opportunity to attend a four-year college or university. The University of Texas at El Paso (UTEP) draws 85% of its students from the local area, and it trains about 70% of the region's teachers. Lack of adequate preparation in a stringent math and science curriculum in secondary schools can handicap prospective teachers and create a major systemic problem. The El Paso USI, grew from the Collaborative's planning process in 1992 and 1993, and was funded in 1994. The plan emphasizes teacher preparation at UTEP, professional development, and recruitment of future teachers from among promising secondary students. The sites vary by region, size, and predominant ethnic composition of students. Size differences are important in view of the relatively larger challenges facing big city school systems, and because NSF funding was the same in all USIs regardless of number of students served. Racial/ethnic variation addresses the importance of language, culture, and racism as variables affecting educational performance.

Methods and data sources. This project involves multiple data sources and data collection and analysis approaches. For example, in determining the extent to which standards-

based approaches to curriculum and instruction in math and science have been implemented in each of our four sites, we are undertaking detailed content analyses of standards-related materials including national, state, and district-level policies. In addition, we are observing summer staff development programs, undertaking detailed classroom-level surveys and observations, and interviewing key policy makers at multiple levels. Finally, we are analyzing student achievement data in addition to other student-level data over a four to five year period.

Initial Findings. In the Spring, 1999 we analyzed baseline data at the school level for each of the four sites included in our study. Having determined a sample of schools matched on such features as student demographics, teacher characteristics, school size and the like, we undertook the process of observing USI-sponsored summer professional development activities and began observations in schools and classrooms in our 47 schools across the four USI sites.

Although our analyses are still in the earliest stages, we would like to report today on some initial observations from our El Paso site. We are learning in El Paso as in each of our sites that standards-based instruction is quite often interpreted through the lens of the high stakes tests used in the site. One unintended outcome of high stakes testing is the practice of "teaching to the test." In El Paso, for example, this reality is being used to provide a vehicle for teachers and students to grapple with how to respond to students' low scoring items on the Texas Assessment of Academic Skills (TAAS). What follows next are comments from teachers in elementary schools participating in the El Paso Collaborative's reforms in math and science.

KW (4th grade teacher): One thing that I found as far as the, the math series is concerned is. . .aligning the program that we have with the test [is critical]. I think really needs to be emphasized, because I almost feel like we've got the math program that we are doing. We've got the TAAS test that's going to come up. And it's like I, I really struggle with the idea, 'which one am I going to teach; which one am I going to emphasize?' And I guess the answer to that is well emphasize this, and it's going to take care of this. But I wonder sometimes if it's really going to do that, and I like the math program we have. But I don't know if it teaches to the test.

RS (6th grade teacher): There are some areas where it teaches concepts on the test and there are some areas that it doesn't directly address {{them}}. And we, we've done some preliminary work with that. We've spent a day in August aligning our curriculum with the test by grade level and just need to continue to revisit that. I personally think, that this is a great concern.

GC (4th grade teacher):We've gone through the alignment part of it by grade level to pull other things in, cause it always seems like you run out of what do I do. I know this is a gap, but how do I fill it. You know, and I think we need to work all together at grade levels to fill in those gaps, so that it's not that case. I know I need to teach that, but I just don't have it together right now. So that's something that needs to be addressed at staff development.

KW: I agree with {{ }}and really have to have children work in a discovery mode of methods of learning And then I know what helped me is really going through and doing training myself for other teachers. I really had to feel like I became my own expert at that in order to do the job that I needed to do. So having hand on experience with kids but also with teachers through training has made me aware of what we need to do with the math.

RS: Okay what I've learned, actually I've been here last year and this year. But what I learned is the problem solving that's going on. And what I did last year was in reality the children were the ones who were teaching me because I wasn't sure what was happening. So I told them, 'Okay along with you, we are both going to be learning.' So what I did is I would ask them questions, and then they'd tell me, 'well this is what happened,' or 'this is what I did.' And so I pulled from that, and then I would turn it around and then facilitate for the ones that didn't understand. So really, the main thing for me in math was the problem solving. The-the way that we do our problem solving problems has helped me to understand math a lot more and put it in pictorials, put it in manipulative. But that's what I've learned the most in the past couple of years.

Another elementary school in El Paso:

AP (4th grade teacher): This is my second year at Pebble Hills. And last year, at the beginning of the year, I was able to attend some training through _____ ISD for math investigations, and that helped me some. I know that any time I've had a question, when I don't understand how to do something, I've asked Rosella Madrid, and she is our USI mentor. But for me, the thing that's helped me the most was actually doing the investigation myself. And trying to put myself in the children's shoes and see how it is they would work it out. And as far as science, next week on the seventh, I will be attending an _____ training. And before I moved to El Paso, I had attended two trainings before that in _____. So I'm really excited about going to another training next week.

(KB):Where were you before?

(AP):I was in South Texas.

(KW):This is my second year teaching here, also. And I think when it comes down to it, my - when I teach math, I I teach the students strategies on how to solve problems. That's all there is to it. And one main way that I do that is I'm a good question asker, and the students are good demonstrators. A lot of the strategies that I teach my students come from the students and they also come from teachers in the in services and also, you know, from day-to-day talk with the teachers. But you know, I want my students to be able to solve problems, and they need different strategies to do that.

Professional Development. Several themes are emerging in our analyses of teachers' talk about teaching math and science. So far these include the following:

1. Teachers value hands-on problem solving approaches to teaching math and science, especially in the elementary grades.

2. Teachers learn instructional strategies from engaging in hands-on staff development work, especially when they interact with other teachers and have opportunities for follow-up in the classroom, and

3. Somewhat surprisingly, teachers can learn effective student problem solving strategies from the students themselves and frequently use these insights to assist other struggling students in the classroom.

Many teachers expressed concerns about implementing standards-based reforms in their classrooms while also responding positively. While at the same time noting their enthusiastic reception, on-going professional development is critical to the process of systemic reform. It follows from my summary of that professional development incorporating hands-on with other teacher and student ideas has great promise for energizing teachers and providing them with information to unify instruction. Currently, a program called Think-Aloud Pair Problem Solving (TAPPS) is being implemented through the Region XIX Center of the Texas Education Association and used in some schools in the El Paso Collaborative. The program provides the opportunity for student peer pairs to respond to two open-ended math problems to solve, one for each of the students in the pair. Students take turns as problem solver vs. listener/interviewer. Teachers trained in the process were audiotaped as they worked with students modeling the process for working in the student pair problem solving arrangement. Analyses of these audiotaped interactions revealed that teachers had a strong tendency to provide students the answers to the problems rather tan facilitating students' own problem solving strategies. Once

teachers were able to reflect on their interactions, most were able to make self corrections in their approaches to coaching student pairs. In selecting problems for students to work on in their pair learning situations, teachers were required to analyze their students' low scoring items on the TAAS and work from these analyses to frame what concept needed further development in the curriculum including the pair problem solving arrangements. The logic of information use in this context was to find low scoring items and focus instruction on the objectives tapped by those items. The immediate problem confronted by teachers is that for any given set of items there are many patterns of student knowledge and skills leading to low performance. Teachers soon realized that getting at the "why" of student test performance required using multiple data sources including think-aloud, distractor choices in an array of items, and student classroom work related to test performance. This strategy is one that is beneficial to instruction for the following reasons:

- Teachers are able to work with test score data for their students and target individual student needs by analyzing student performance in line with assessments keyed to state standards;
- Teachers and students focus on specific skills and competencies in line with state standards.

Despite these and other useful outcomes, the strategy is less than perfect. Teachers observed during TAPPS sessions persisted in providing students with information that led students to the correct responses rather than allowing students to discover solutions themselves.

Conclusions. Addressing concerns for alignment of standards and practices at the classroom level is critical in any discussion of systemic standards-based reform. Two concerns remain in our current work: 1) identifying the context of policies involved in reform, and 2)

discussing policy alignment as it relates to reform strategies. First, as schools, school systems, state governments and federal legislation frame and implement diverse sets of education policies, research must acknowledge the interests of each level of control to determine how interests at each level shape policy in a vertically integrated system of school authority (See Figure 1). Second, social equity forms a set of formal or informal (unwritten) educational policies important to student outcomes. Thus, a concern is how the alignment of policies affects efforts at reform at the local level. In particular, Smith and O'Day (1991) suggest that coordinated and aligned policies are crucial to the establishment and maintenance of systemic reform in a context informed by equity concerns.

While the implementation of standards-based constructivist teaching practices has become a cornerstone in systemic school reform efforts following the NCTM *Curriculum and Evaluation Standards for School Mathematics* in 1988, measuring indicators of standards-based instruction is difficult. One reason this is the case is the variation in the interpretation of *Standards* implemented in each school in curriculum, instruction, and assessment. Current research highlights teacher quality as the most significant factor affecting student achievement. On-going in-service education such as the TAPPS in addition to overall qualifications of math and science teachers are critical in determining student success. Using standards-based assessments such as the TAAS and the FCAT can be an important source for targeting student needs so long as (1) needs are not equated with low levels of basic skills and (2) instruction does not become bifurcated into "fun stuff" and teaching to the test in a narrow fashion. Despite the importance and value of standards-based teaching and assessment practices, these and other issues remain in addressing the policy to practice gap. Our project seeks to address and understand these issues.

Figure 1 Model of Systemic Issues in Implementing Standards-based Practices
(Poehlman, J.)

	Policy Concerns		*Social Concerns*
National Level Forces	National Policy- *Moving toward standards-based instruction, curriculum and assessments in U.S. education.*	Nation at Risk (1983) GOALS 2000 (1994)	Desegregation
State Level Forces	State Policy	Coordinated Standards and Assessments Teacher Certification	Opportunity to Learn - Tracking
Local Level Forces	School Design	New American Schools, Magnet Schools, etc.	
	Free-Market and Entrepreneurial Schools	Vouchers and Charters	
	Policy to Practice Gap		
	Classroom Learning		

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